

Rethinking Energy—Implementing the Global Future Locally Today

Seoul has a vision, and Seoul has made a promise. The vision is striking. The promise is ambitious. Can Seoul realize the vision, and fulfil the promise? Seoul's progress thus far has been impressive, indeed spectacular. The progress thus far means that the time has come to look more closely at the vision, to understand more clearly what it means for the longer-term future, not only of Seoul but also of other cities around the world. We should also now examine and update the promise, to find out how best to fulfil it, to expand it and to replicate it for other cities. Seoul can show us how to implement the global future locally, and to do so immediately - today. One key will be to rethink energy - what we mean by it, how we access it and how we use it.

Seoul's vision emerged initially as the project entitled 'One Less Nuclear Power Plant', launched by Mayor Park and the Seoul Municipal Government in June 2012. The centrepiece of the vision was a city less dependent on fuel and electricity from beyond the city limits of Seoul. The first target was to reduce Seoul's 'imports' of fuel and electricity from outside the city by the equivalent of the output of a 1-gigawatt nuclear power plant. The deadline to reach this target was set to be two-and-one-half years later, the end of 2014. The citizens of Seoul beat this deadline by six months, reaching the targeted reduction by June 2014.

Phase two of the vision, launched in July 2014, was entitled 'Seoul Sustainable Energy Action Plan'. The promise was to make Seoul a sustainable city, for climate and environment. The change of emphasis is important. Phase two is not about reductions but about improvements. Again, one key to fulfilling the promise will be what we describe as 'sustainable energy'.

We'll be using the word 'energy' a lot today. My international colleagues and I are members of the Seoul International *Energy* Advisory Council, and this is the third Seoul International *Energy* Conference. But think about this word 'energy'. I looked up the Korean equivalent and found 'ghee'. But I don't think that's what we're talking about today. For what we're discussing today, Korean seems to use the imported english word 'eneoji'. Beware of this english word. It can be very misleading.

In English, we use the word 'energy' all the time. But we are careless about its meaning. We say 'energy' when we really mean oil; or coal; or natural gas; or electricity. They are not the same, not interchangeable. But lumping them all together and calling them all 'energy' makes too many people, especially politicians, think they are the same - that one can substitute for another. We talk about 'energy supply', when we really mean 'oil supply' - not the same as 'gas supply' or 'electricity supply'. In any case, nobody wants 'energy'. Have you ever put 'energy' on your shopping list? I have not. What really matters in our daily lives is not 'energy' but what we do with it.

Why do we need these supplies? That is the key detail we so often ignore. We need fuels and electricity to run *things*. What matters are the *things* - lamps, motors, electronics, appliances, industrial plant, vehicles and especially buildings. These things, these physical artefacts, actually do for us what we want to do.

In purely physical terms everything we do, everything humans have ever done, falls into just six categories. First of all, we control heat flow, using physical things. You put on a sweater to keep warm, or open the window to let the heat out. Second, we adjust local temperature. You turn the thermostat up or down. Third, we make light. You strike a match, or switch on an electric lamp. Fourth, we exert force. You lift a weight or open a door. Fifth, we move things - by exerting force, but the activity is so important it needs its own category. You pedal a bicycle or pull a wagon. Sixth, but perhaps the most important, we manage information. You talk and listen, now not only in person but ever more remotely, with ever more ingenious devices. For these six activities we use physical things, and two processes - fire and electricity. Keep those two processes in mind.

These six physical activities give what we actually want - comfort, illumination, motive power, refrigeration, mobility, information, communication. We sometimes call these 'energy services'. But even that is misleading, as if the so-called 'energy' - the fuel or electricity - provided the service. It does not. In these activities the most important factor is the things, the physical things - not the fuel or electricity. Oil by itself is almost useless. Natural gas by itself is downright dangerous. Electricity as we use it does not even exist by itself. It's a *process* in *things*. Fuels are only useful because of *things* - the physical artefacts that do what we want to do.

Think about Seoul's Sustainable Energy Action Plan. Its various components embody all the six physical activities we humans do. The Building Retrofit Programme gives better control of heat flow - the first activity - by improving the things, the buildings, that control heat flow for us. The Energy Consulting Service for Buildings offers better management of local temperatures - the second activity. The LED lighting programme makes better light with fewer resources and less waste - the third activity. In Seoul you already exert force - the fourth activity - mostly with electric motors and electricity. You are producing more and more of the electricity you use here in Seoul, producing it ever more locally, even in individual buildings, and producing it cleanly. The Driving Mileage Programme, car-sharing, pedestrian zones and car-free events are all examples of the fifth activity, improving the ways we move people and goods. The Action Plan itself is a vivid example of the sixth activity, managing information. Mayor Park and his colleagues, and all the citizens of Seoul taking part in discussions and plans, share information and communicate continually - essential to implement measures effectively, a key reason for the success of the vision and the promise.

The free-market enthusiasts that have shaped what they call energy policy in industrial countries for the past quarter-century talk a lot about competition. But they miss the point. The real competition, the competition that matters, is between *fuel* and *things* - the things that do what we want to do. Better things - lamps, motors, vehicles, electronics and especially buildings - need less fuel to give us the same or better services. Fuel and things compete directly with each other. Key competitors for ExxonMobil are not Shell nor BP but Hyundai and Kia. Competitors for Korea Gas are Korea's manufacturers and installers of thermal insulation. Competitors for KEPCO are the manufacturers and installers of LED lamps; and so on.

Around the world, and that includes South Korea's national government, what most officials today call 'energy policy' still concentrates on fuels and electricity - what we used to call 'fuel and power policy'. It takes the things, the physical assets that do what we want, for granted and ignores them, except as aggregates and averages of so-called 'energy demand'. But we do not have 'energy demand', or an 'energy problem'. We have many different, specific and distinct problems: how best to carry out many different activities all over the world, with many different specific things, that may - or may not - require specific fuel or electricity. Effective policy should foster this crucial competition between *fuel* and *things*. Over the years we have burdened ourselves with a vast array

of inadequate things, especially inadequate buildings. But instead of making the buildings better we pour more and more fuel and electricity into them. That is like opening the bathtaps wider without putting in the plug.

Planners talk a lot about what they call 'energy efficiency'. In practice, however, when most people talk about 'energy efficiency', they mean how well something uses fuel or electricity. But this kind of energy efficiency tells you nothing about how well the thing does for you what you want it to do. A well-designed house in a temperate climate like that of South Korea - think of a German 'passive house' - can keep you comfortable year-round with no fuel or electricity at all. 'Efficiency' as the term is commonly used would be meaningless.

Seoul's vision and promise show that we can move on, no longer focusing obsessively on fuel and electricity. Efficiency is not about 'energy', about fuel and electricity - it's about *things*, making *things* better, so we need less fuel and electricity to do what we do, and do it better. The first objective of a coherent strategy for climate, security and affordability should be to upgrade the things that do for us what we want to do, especially our built infrastructure. Then, while we are improving the things, the physical assets, we should also look much more carefully at the two processes they use - fire and electricity.

If you say 'energy system' today, politicians and commentators all assume you mean a system to supply coal, oil, gas and electricity. But what we need is a better way to do what we do - what I prefer to call a human activity system. To design this better system we should understand clearly what we want it to do for us. Human activity systems are made up of the physical artefacts I've already mentioned, including buildings, lamps, motors, vehicles and electronics. They use two processes - fire, and electricity.

Fire still dominates. The Fire Age began in the early Stone Age. The Fire Age even came before us. It predates *homo sapiens*. Our Neanderthal forerunners had fire. We have evolved with fire. We think of fire as cosy and welcoming. But fire is actually a violent, extreme process. Fire produces heat at a temperature so high it's dangerous. Fire turns resources rapidly into waste. Much of this waste is pernicious, locally or globally. Fire, and what it pours into the air - smoke, particulates, sulfur and nitrogen oxides, possibly mercury and polycyclic hydrocarbons - is the reason you can't breathe in Beijing. The urgent desire to feed fire makes governments fight each other over the Arctic seabed. Fire produces the carbon dioxide upsetting the atmosphere and overheating the oceans. We have let fire get out of control, and the consequences grow steadily more alarming.

Nevertheless we still rely on fire for most of our activities - even when we need not, and despite the ever intensifying problems fire creates. To address these problems - pollution, security, climate - we should aim to reduce and eventually minimize human use of fire. However, because we have evolved with fire, we have long taken for granted its deleterious consequences. We still, for instance, consider coal-fired heat and electricity to be cheap, even as coal fire strangles city air and upsets global climate. We need to acknowledge and account for the true cost of fire. If we do not, spurious comparisons of cost will lead us to choose disaster.

Even if we do try to account for the true cost of fire, however, moving beyond this Fire Age will not be easy. Fire plays a central role in today's global economy. Some of the world's largest companies, and indeed entire countries, depend for their revenue on feeding fire. We already have a vast worldwide infrastructure, buildings, industrial plant and power stations, that could not function without fire. We have laid out society so that we now depend for mobility on fire, in cars, trucks, ships and aircraft. Nevertheless we use fire in many unnecessary ways, to compensate for instance

for the inadequacy of buildings. Simply improving buildings could reduce dramatically our use of fire.

The other key to the transformation we need is electricity. For the past century electricity has been steadily supplanting fire for most human activities. We make light with electricity and electric lamps. We exert force with electricity and electric motors. We manage information with electricity, computers, smartphones and so on. Fire is a chemical process. Electricity is not. Electricity is a physical process. Electricity under human control does not destroy what it happens in. Electricity does not produce pernicious waste. Electricity can save us from fire, and the damage that fire is doing to our world - except, of course, for one awkward detail. We still make most of our electricity using fire, not to mention the even more violent, extreme process of nuclear fission.

We don't need to. We've known since the earliest days of electricity how to make it without using fire, with chemical batteries and by harnessing natural forces such as wind, moving water and more recently sunlight as useful electricity, and we are doing so more and more, around the world. However, we have convinced ourselves that making electricity with fire is less costly than these other methods. Because we evolved with fire, we have never accurately costed its pernicious consequences. Because our cost comparisons are wildly inaccurate, we continue to use fire-based electricity, rather than the many much less damaging forms of fire-free electricity.

We have even come to treat electricity as though it were fire. We buy and sell electricity as if it were a commodity, in short-term batch transactions where what matters is the price per unit. But electricity is not a commodity. It is a process, happening instantaneously throughout an entire system, including the things that do what we want to do. Making light, exerting force, moving people and goods and managing information are themselves processes that our activity systems carry out for us. What we need, what our transactions ought to foster, is access to these processes. Thomas Edison initially charged his customers according to how many lamps they had. They were paying to have electric light available, for access to the process, just as you may now pay rent to have access to the comfort of a home. You do not buy comfort by the unit. Comfort is not a commodity. It is a process. But for too many processes, too many services, we have drifted far along a misguided and dangerous blind alley.

Electricity as a process can now be completely independent of fire. We need urgently to accelerate the shift away from fire-based electricity to what we have come to call renewable electricity. A more telling description is 'fire-free electricity' - physical assets such as wind turbines and photovoltaic arrays that turn natural ambient energy into useful electricity. We need to establish financial and institutional ground-rules and incentives to make fire-free electricity the norm, and phase out electricity based on fire. That can start - indeed has already started - with governments. National governments are laggards. But city governments around the world - notably the government here in Seoul - are already showing the way.

One great advantage for cities is that they enclose many human activity systems more or less completely within their local boundaries. That applies, for instance, to the buildings and other physical assets that deliver services, to much of the mobility people use, and to much of the renewable fire-free generation available within cities. Cities, their citizens and their governments can therefore make and implement many important decisions about what to do and how to do it, rather than being subject to decisions made by remote and centralized authorities elsewhere. City governments, local and close to their citizens, have realized that they can lead the way, by information, organization and demonstration. Seoul is a shining example.

One particularly effective form of leadership is not legislation or regulation. It is the role of city governments as major users of human activity systems, and of fire and electricity. City governments are highly desirable customers, who can define the business they want to do and the contracts they offer. As Seoul has already vividly demonstrated, city governments can upgrade their own buildings. They can replace public lighting of every kind, above ground and underground, with LEDs. They can install local electricity generation and cogeneration, heat networks, private-wire electricity networks and microgrids. What is also crucially important is that they can publicize these and similar projects, as demonstrations for their private industry and their private citizens.

In physical terms, all of the different parts of the Seoul programmes come together in three linked themes. The first is upgrading to better things - buildings, lamps, motors, vehicles, electronics - to get better performance while using less fire or electricity. The second is moving from activities based on fire to activities based on electricity - for instance from petrol vehicles to electric vehicles. The third is moving from fire-based to fire-free electricity - for instance from coal and gas-fired electricity to wind and solar electricity. Taken together, these three themes tell a coherent story. It describes in physical terms exactly what you are doing here in Seoul - all the various policies and programmes, all the various activities, and the citizens of Seoul who are implementing them.

I have long believed that those of us who think this way need a better story to describe what we want to happen. This year I have finally published a book that tries to tell this story, the story I've outlined here this morning. The book is called *Electricity Vs Fire: The Fight For Our Future*. It describes what we do, how we do it and how we can do better. Unfortunately it is not available in Korean. But I think those of you who read English would find it easy to read. I gave a copy to my irreplaceable housekeeper in England. Two weeks later she told me 'I read the whole book, I really enjoyed it and I understood everything' - the best testimonial I could possibly receive.

This story, the story Seoul is telling, is not just about rethinking energy. Seoul's vision and Seoul's promise are also about about fairness, cooperation, responsibility and participation - crucial keys to living together successfully. Seoul is showing how we can implement the global future locally, today. The world needs to hear the story of Seoul.

(c) Walt Patterson 2015

Walt Patterson is associate fellow in the Energy, Environment and Resources programme at Chatham House, London, and chair of the Seoul International Energy Advisory Council. His latest book is Electricity Vs Fire: The Fight For Our Future.

